

Activity 6

The Electromagnetic Spectrum and Your Community

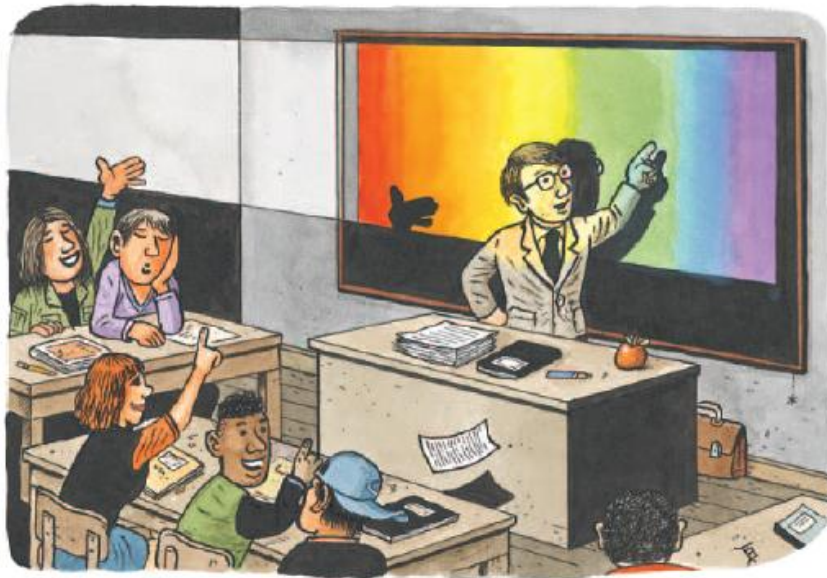
Think About It

Date

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- What does a prism reveal about visible light?
- The sun produces light energy that allows you to see. What other kinds of energy come from the sun? Can you see them? Why or why not?



WHAT DO YOU THINK?

The Electromagnetic Spectrum and Your Community

Investigate Part A

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1a. Write down the order of the colors you observed.

1b. Record your observations.

2a. Write down the order of the colors you observed.

3a. Write down the order of the colors you observed.

4a. How did the colors and the order of the colors differ between reflected sunlight, fluorescent light, and the incandescent light?

4b. What would light from other stars look like through your spectroscope?

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Digging Deeper

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A star's color

indicates its temperature:

Hottest stars → blue

Cooler stars → red

Reddish stars

are a “cool” 3000 to 4000 K

Bluish stars

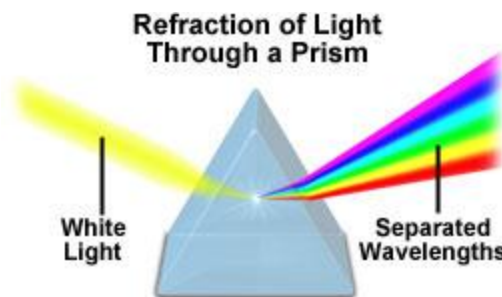
are hot—over 20,000 K

Sun

stars the temperature of our sun
are yellow in color

Spectrum (spectra)

a band of colors created when
white light passes through a prism



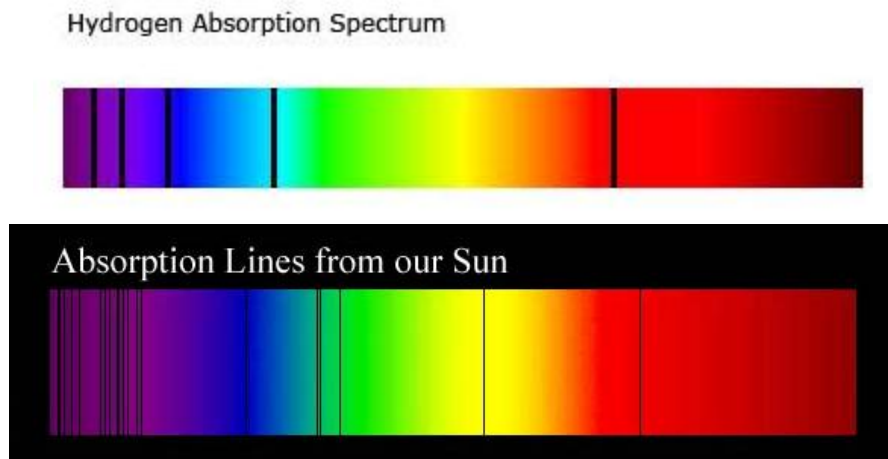
Absorption
spectrum

light coming from a star passes
through the star's atmosphere

As it does, elements in the
atmosphere absorb some of this
light

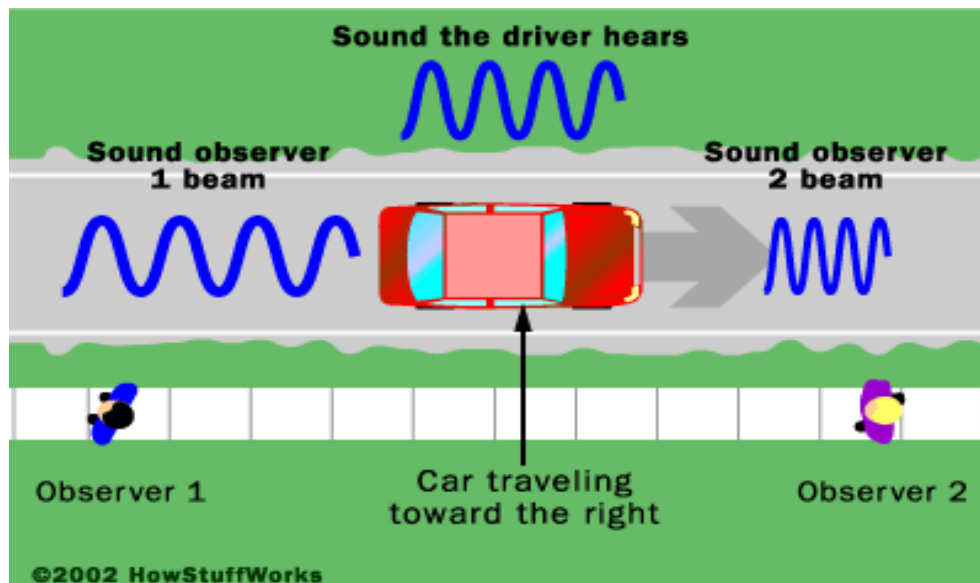
The wavelengths of visible light that are absorbed appear as dark lines in the spectrum

The pattern of lines can be used to identify the elements in a star's atmosphere



Spectra reveal motion of the star and the speed of the motion

Doppler shift causes changes in the light coming from distant stars and galaxies

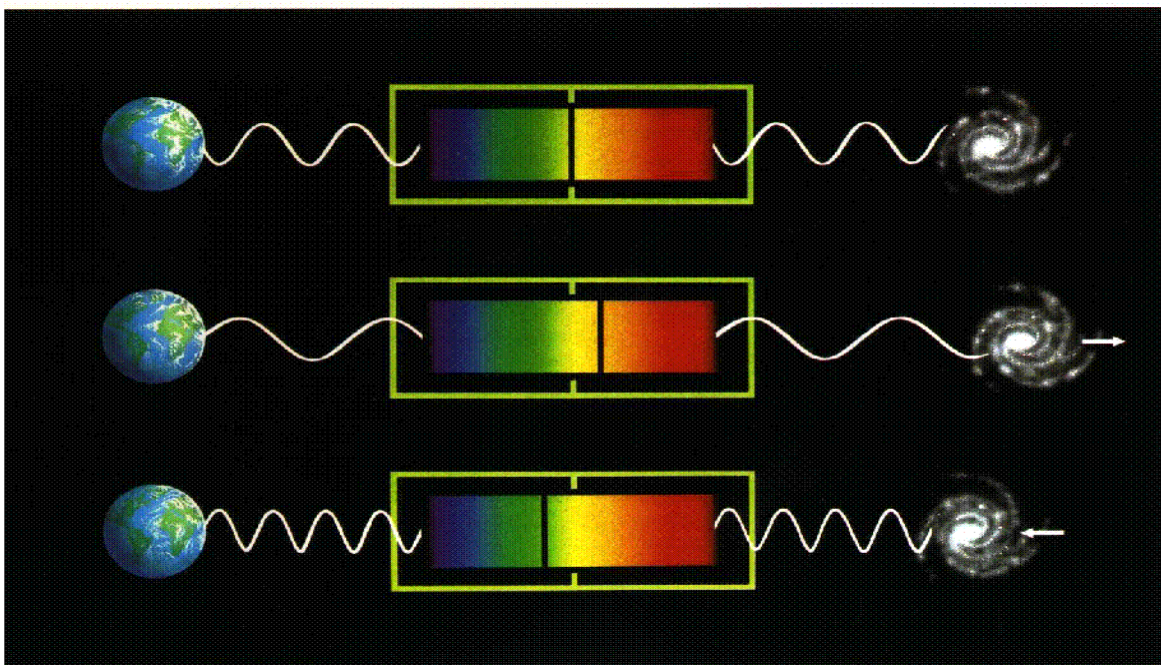


<http://www.kettering.edu/~drussell/Demos/doppler/carhorn.wav>

http://www.wwnorton.com/college/geo/egeo/flash/1_1.swf

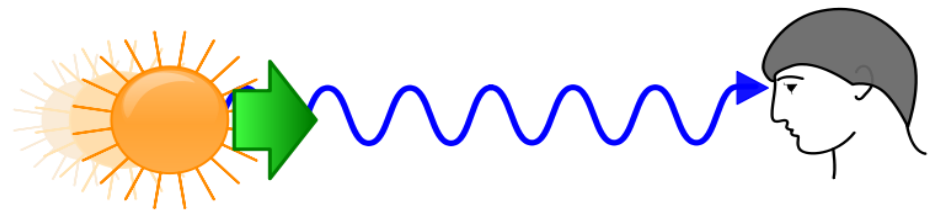
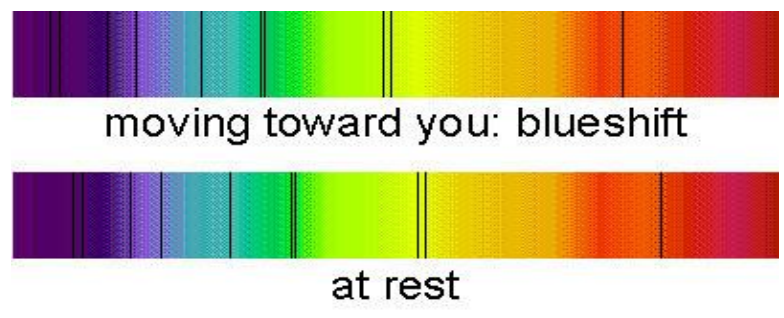
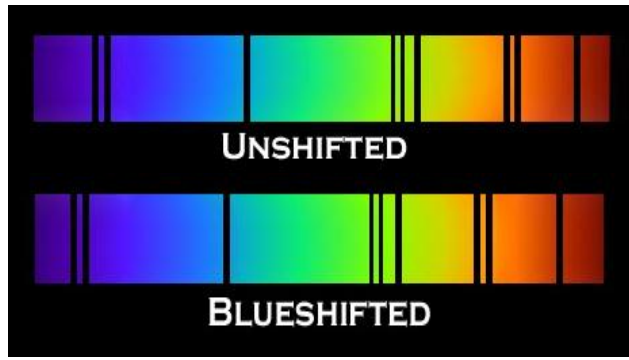
If a star is moving toward Earth its wavelengths of light are compressed

If a star is moving away, its wavelengths are stretched



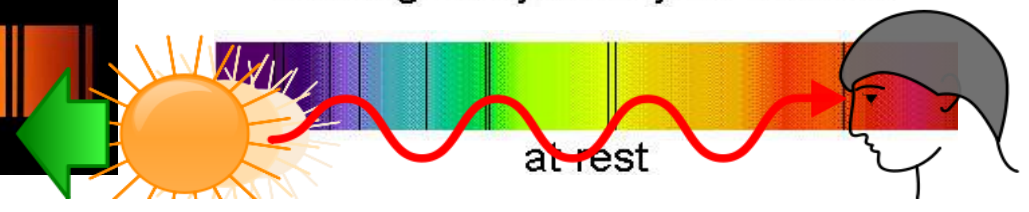
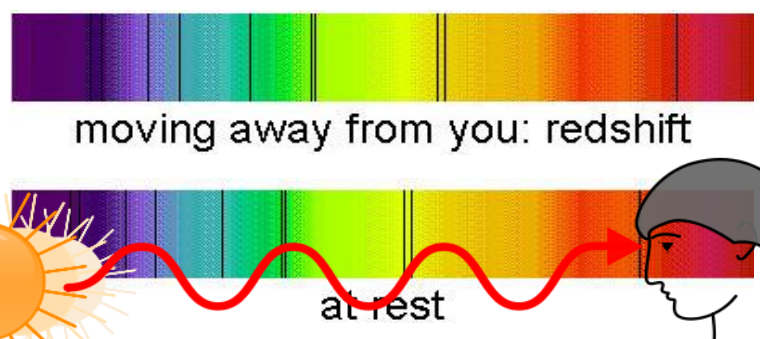
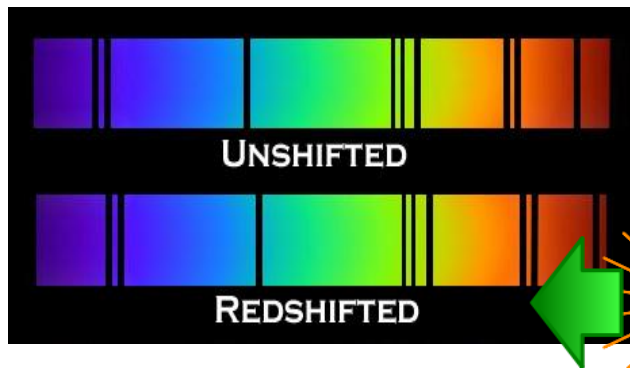
Doppler shift

the dark lines move toward the blue-violet end of the spectrum if a star is moving toward Earth



The dark lines move to the red end of the spectrum when a star is moving away from Earth

This is called a red shift



Edwin Hubble

saw a red shift in the light coming from galaxies beyond the Milky Way

Red shift

because all galaxies beyond the Milky Way show a red shift in their spectra, they must be moving away from Earth

If all the galaxies are moving away from Earth, the entire universe must be expanding

http://www.wwnorton.com/college/geo/egeo2/content/animations/1_2.htm

Big Bang theory

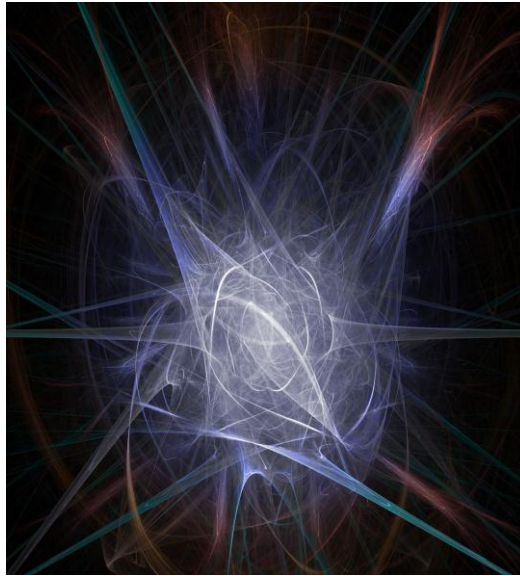
approximately 13.7 billion years ago, the universe began to expand everywhere at the same time

Big Bang theory

1. Within fractions of a second, the universe grew from the size of a head of a pin to 2000 times the size of the sun



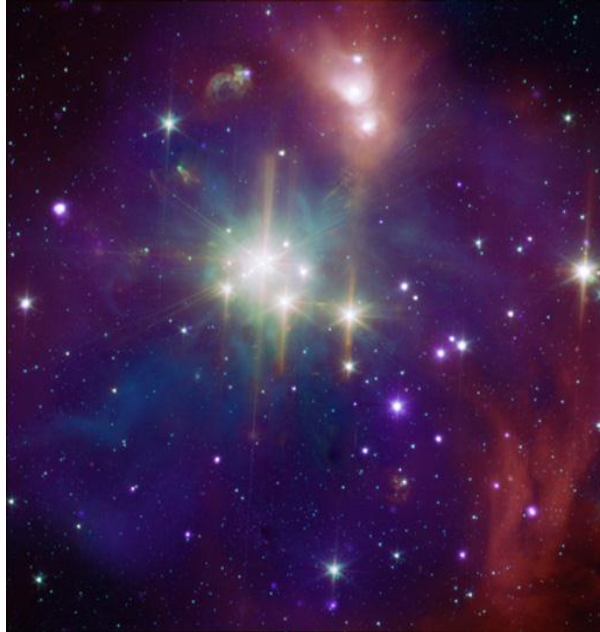
2. By the time the universe was one second old, it was a dense, opaque, swirling mass of elementary particles



3. Matter began collecting in clumps. As matter cooled, hydrogen and helium gases formed.



4. More than a billion years after the initial expansion, the first stars were born.



http://imgsrc.hubblesite.org/hu/db/2003/27/videos/b/formats/low_quicktime.mov

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Check Your Understanding

Date

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1. Describe the Big Bang theory and the formation of the universe.
2. How does a red shift support the Big Bang theory?